

# Claims

- [c1] A valve for regulating fluid flow comprising:
- a stepper motor;
  - a first valve chamber that includes an inlet port for receiving fluid into the valve;
  - a second valve chamber that includes an outlet port for dispensing fluid from the valve, wherein the first valve chamber includes an opening between the first valve chamber and the second valve chamber;
  - a first member that is rotatable and operatively attached to the stepper motor;
  - a second member that engages the first member for linear movement of the second member between a first position and a second position when the first member is rotated by the stepper motor; and
  - a sealing mechanism that is operatively attached to the second member, wherein the sealing mechanism can move adjacent to the opening when the second member is in the first position and the sealing mechanism can move away from the opening when the second member is in the second position.
- [c2] The valve for regulating fluid flow as set forth in Claim 1,

wherein the stepper motor, the first valve chamber, the second valve chamber, the first member, the second member and the sealing mechanism are all enclosed within a housing.

[c3] The valve for regulating fluid flow as set forth in Claim 1, further including a biasing mechanism that is in contact with the second member.

[c4] The valve for regulating fluid flow as set forth in Claim 3, wherein the biasing mechanism includes a return spring.

[c5] The valve for regulating fluid flow as set forth in Claim 1, wherein the first member includes a screw having a plurality of protrusions.

[c6] The valve for regulating fluid flow as set forth in Claim 1, wherein the second member includes a needle having a plurality of indentations.

[c7] The valve for regulating fluid flow as set forth in Claim 1, wherein the second member includes a metering orifice to provide fluid flow between the first valve chamber and the second valve chamber, wherein the metering orifice can be selectively blocked by the sealing mechanism.

[c8] The valve for regulating fluid flow as set forth in Claim 7, wherein the metering orifice includes a triangular shape.

- [c9] The valve for regulating fluid flow as set forth in Claim 1, wherein the sealing mechanism includes a poppet.
- [c10] The valve for regulating fluid flow as set forth in Claim 1, further including a cover member located between the stepper motor and the sealing mechanism.
- [c11] The valve for regulating fluid flow as set forth in Claim 10, wherein the cover member includes at least one protruding member that can be positioned against the sealing mechanism to secure the sealing mechanism against the opening.
- [c12] The valve for regulating fluid flow as set forth in Claim 11, wherein the at least one protruding member of the cover member that is capable of being positioned between a plurality of retaining members on the second member to restrict rotation of the second member.
- [c13] The valve for regulating fluid flow as set forth in Claim 1, further including a terminal connector mechanism that provides at least one electrical connection to the stepper motor.
- [c14] The valve for regulating fluid flow as set forth in Claim 1, wherein the inlet port for the valve is fluidly connected to a bypass loop that receives fluid flow from an engine that

was pumped into the engine from a water pump, wherein the outlet port of the valve is fluidly connected to an inlet for the water pump.

[c15] The valve for regulating fluid flow as set forth in Claim 1, wherein the inlet port for the valve is capable of fluid connection to an engine and the outlet port of the valve is capable of fluid connection to a heater core.

[c16] A valve for regulating fluid flow comprising:  
a stepper motor;  
a first valve chamber that includes an inlet port for receiving fluid into the valve;  
a second valve chamber that includes an outlet port for dispensing fluid from the valve, wherein the first valve chamber includes an opening between the first valve chamber and the second valve chamber;  
a first member that is rotatable and operatively attached to the stepper motor;  
a second member that engages the first member for linear movement of the second member between a first position and a second position when the first member is rotated by the stepper motor;  
a sealing mechanism that is operatively attached to the second member, wherein the sealing mechanism can move adjacent to the opening when the second member is in the first position and the sealing mechanism can

move away from the opening when the second member is in the second position;  
a biasing mechanism that is in contact with the second member; and  
a housing that encloses the stepper motor, the first valve chamber, the second valve chamber, the first member, the second member, the biasing mechanism and the sealing mechanism.

[c17] A valve for regulating fluid flow comprising:  
a stepper motor;  
a first valve chamber having an inlet port for receiving fluid into the valve;  
a second valve chamber having an outlet port for dispensing fluid from the valve, wherein the first valve chamber includes an opening between the first valve chamber and the second valve chamber;  
a screw, having a plurality of protrusions, which is rotatable and operatively attached to the stepper motor;  
a needle, having a metering orifice and a plurality of indentations, that engages the plurality of protrusions on the screw for linear movement of the needle between a first position and a second position when the screw is rotated by the stepper motor;  
a poppet that is operatively attached to the needle, wherein the poppet can move adjacent to the opening

when the needle is in the first position and the sealing mechanism can move away from the opening when the needle is in the second position and selectively block the opening of the metering orifice to control fluid flow; a return spring that is in contact with the needle; and a housing that encloses the stepper motor, the first valve chamber, the second valve chamber, the screw, the needle, the return spring and the poppet.

- [c18] The valve for regulating fluid flow as set forth in Claim 17, wherein the metering orifice includes a triangular shape.
- [c19] The valve for regulating fluid flow as set forth in Claim 17, further including a cover member located between the stepper motor and the poppet that includes at least one protruding member that can be positioned against the poppet to secure the poppet against the opening.
- [c20] The valve for regulating fluid flow as set forth in Claim 19, wherein the at least one protruding member of the cover member that is capable of being positioned between a plurality of retaining members on the needle to restrict rotation of the needle.
- [c21] The valve for regulating fluid flow as set forth in Claim 17, wherein the inlet port for the valve is fluidly con-

nected to a bypass loop that receives fluid flow from a engine that was pumped into the engine from a water pump, wherein the outlet port of the valve is fluidly connected to an inlet for the water pump.

[c22] The valve for regulating fluid flow as set forth in Claim 17, wherein the inlet port for the valve is capable of fluid connection to an engine and the outlet port of the valve is capable of fluid connection to a heater core.

[c23] A method for regulating fluid flow with a valve comprising:

rotating a first member that is operatively attached to a stepper motor within a valve, having a first valve chamber having an inlet port for receiving fluid into the valve and a second valve chamber having an outlet port for dispensing fluid from the valve, wherein the first valve chamber includes an opening between the first valve chamber and the second valve chamber;

moving a second member that engages the first member between a first position and a second position when the first member is rotated by the stepper motor;

moving a sealing mechanism that is operatively attached to the second adjacent to the opening when the second member is in the first position; and

moving the sealing mechanism away from the opening when the second member is in the second position.

- [c24] The method for regulating fluid flow with a valve as set forth in Claim 23, further includes applying force against the second member with a biasing mechanism.
- [c25] The method for regulating fluid flow with a valve as set forth in Claim 23, further includes controlling the fluid flow through a metering orifice in the second member by selectively blocking the metering orifice with the sealing mechanism.
- [c26] The method for regulating fluid flow with a valve as set forth in Claim 23, further includes securing the sealing mechanism against the opening with a protruding flange member of a cover member against the sealing mechanism.
- [c27] The method for regulating fluid flow with a valve as set forth in Claim 23, further including positioning at least one protruding member of a cover member between a plurality of retaining members on the second member to restrict rotation of the second member and lessen the rotational load created by the biasing mechanism.
- [c28] The method for regulating fluid flow with a valve as set forth in Claim 23, further including:  
connecting, in fluid relationship, the inlet port for the valve to a bypass loop that receives fluid flow from an



engine, wherein the engine receives fluid that was pumped into the engine from a water pump; and connecting, in fluid relationship, the outlet port of the valve to an inlet for the water pump.

[c29] The method for regulating fluid flow with a valve as set forth in Claim 23, further including:

connecting, in fluid relationship, the inlet port for the valve to the engine; and

connecting, in fluid relationship, the outlet port of the valve to a heater core.

[c30] A method for regulating fluid flow with a valve comprising:

rotating a screw, having a plurality of protrusions, which is operatively attached to a stepper motor within a valve, having a first valve chamber having an inlet port for receiving fluid into the valve and a second valve chamber having an outlet port for dispensing fluid from the valve, wherein the first valve chamber includes an opening between the first valve chamber and the second valve chamber;

moving a needle, having a metering orifice and a plurality of indentations, that engages the plurality of protrusions on the screw for linear movement of the needle between a first position and a second position when the screw is rotated by the stepper motor against a force ap-

plied by a return spring;  
moving a poppet that is operatively attached to the needle adjacent to the opening when the needle is in the first position; and  
moving the poppet away from the opening when the needle is in the second position as well as selectively blocking fluid flow through the metering orifice based on the position of the poppet.

[c31] The method for regulating fluid flow with a valve as set forth in Claim 30, further includes securing the poppet against the opening with a protruding flange member of a cover member against the poppet.

[c32] The method for regulating fluid flow with a valve as set forth in Claim 30, further including positioning at least one protruding member of a cover member between a plurality of retaining members on the needle to restrict rotation of the needle and lessen the rotational load created by the return spring.

[c33] The method for regulating fluid flow with a valve as set forth in Claim 30, further including:  
connecting, in fluid relationship, the inlet port for the valve to a bypass loop that receives fluid flow from an engine, wherein the engine receives fluid that was pumped into the engine from a water pump; and

connecting, in fluid relationship, the outlet port of the valve to an inlet for the water pump.

- [c34] The method for regulating fluid flow with a valve as set forth in Claim 30, further including:
- connecting, in fluid relationship, the inlet port for the valve to the engine; and
  - connecting, in fluid relationship, the outlet port of the valve to a heater core.